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CROSS-VALIDATION OF THE ORLEANS-HANNA ALGEBRA PROGNOSIS TEST AND THE ORLEANS-HANNA GEOMETRY PROGNOSIS TEST

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THE procedure of cross-validation is a necessary step in establishing the predictive power of a prognostic instrument in which weights are applied to the separate parts making up the total score. The technique involves the determination of the "best" weights with an initial sample and the subsequent verification of these weights with a second sample from the same population.

A total score on the Orleans-Hanna Algebra Prognosis Test and on the Orleans-Hanna Geometry Prognosis Test, is a composite of (a) four student-reported past course-grades, (b) student-predicted course-grade in algebra or geometry, and (c) number right of the Prognosis Test work-sample items. For both of the Orleans-Hanna tests, an a priori weight of two was assigned to each of the five course-grade variables and a weight of one was assigned to the test score representing the number of work-sample items answered correctly. Validation studies (Orleans and Hanna, 1968 a, b) were undertaken during the norming of the tests to determine the multiple regression weights for predicting each of the four criteria of success: mid-year and final course grades, and mid-year and end-of-year achievement test scores. The multiple correlations were then compared to the zero-order correlations obtained with the a priori

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weights. The results of these studies indicated that the weights, as initially assigned, could be applied in the final scoring process without significant loss in prediction. These weights were thus incorporated into the standard scoring procedure and were used in computing the total score and related normative data reported in the test manuals.

The purpose of the investigation reported here was to determine the appropriateness of the assigned weights in predicting similar criteria for new samples of algebra and geometry students.

Method. In June, 1968, 335 eighth-grade students took the Orleans-Hanna Algebra Prognosis Test and 331 ninth-grade algebra students took the Orleans-Hanna Geometry Prognosis Test. The school system cooperating in this study had not been included in the original validation sample. In January, 1969, the Mid-Year Algebra Test and the Mid-Year Geometry Test were given to those students who had enrolled in algebra or geometry. At the same time, algebra and geometry teachers, without access to test scores, reported mid-year grades for their students. In June, 1969, algebra students were given the Lankton First-Year Algebra Test and geometry students were given the Howell Geometry Test. Final mathematics grades were collected independently of the achievement test scores. Results of the prognosis tests were not released to school personnel until all criterion data had been collected.

Summary statistics, and zero-order and multiple correlation coefficients are presented in Tables 1 and 2 for the algebra and geometry cross-validation samples, respectively.

TABLE 1

Correlations of the Orleans-Hanna Algebra Prognosis Test with Four Criteria of Success

	Prognosis Test		Criteria			
	Total Sample	Sample Taking Algebra	Mid-Year Grade*	Mid-Year Test	Final Grade*	Final Test
r			.72	.73	.70	.77
R			.73	.73	.73	.78
N	335	194	194	193	190	183
Mean	67.6	74.0	2.6	24.6	2.6	30.5
SD	16.7	13.1	1.2	8.5	1.2	10.1

*A = 4, B = 3, C = 2, D = 1, E/F = 0.

TABLE 2

Correlations of the Orleans-Hanna Geometry Prognosis Test with Four Criteria of Success

	Prognosis Test		Criteria			
	Total Sample	Sample Taking Geometry	Mid-Year Grade*	Mid-Year Test	Final Grade*	Final Test
r			.64	.74	.60	.78
R			.67	.75	.66	.79
N	331	239	239	239	230	217
Mean	48.6	50.5	2.5	27.6	2.4	21.6
SD	12.5	12.2	1.2	6.7	1.1	8.4

* A = 4, B = 3, C = 2, D = 1, E/F = 0.

Results and conclusions. Examination of Table 1 reveals that with the assigned a priori weights, each of the zero-order correlations (r) between the Algebra Prognosis Test and each of the four criteria of success is sufficiently close to the corresponding multiple correlation (R) coefficient obtained when the predictor variables were optimally weighted, to make further refinement unneccessary (Bligh, Lenke, Hanna, 1969). Similarly, Table 2 indicates that very little predictive efficiency is lost when the assigned weights are applied in scoring the Geometry Prognosis Test. It appears, therefore, that the weights deemed appropriate for the original validation sample and recommended as part of the standard scoring procedure are equally appropriate for the cross-validation sample. One can further conclude that these weights will be equally appropriate for other samples of students within the same population.

REFERENCES

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